

WHAT IS CLAIMED IS:

1. An implantable medical device with a calcium phosphate coating comprising:
 - 5 (a) substrate; and
 - (b) calcium phosphate coating on the substrate, said coating having desired bonding and porosity characteristics.
- 10 2. A device as claimed in claim 1 wherein the calcium phosphate coating is hydroxyapatite.
- 15 3. A device as claimed in claim 1 wherein the thickness of the calcium phosphate coating is between about 0.00001 mm and 0.01 mm.
- 20 4. A device as claimed in claim 1 wherein the thickness of the calcium phosphate coating is between about 0.001 mm and about 0.0001 mm.
5. A device as claimed in claim 1 wherein the tensile bond strength between the substrate and the calcium phosphate coating is greater than about 20 MPa.
- 25 6. A device as claimed in claim 1 wherein the calcium phosphate coating is deposited on the device as particles having a diameter between about 1 μm and 100 μm and a thickness of between about 1 μm to 10 μm .
7. A device as claimed in claim 1 wherein the particles cover about 20% to about 99% of the surface of the substrate.
- 30 8. A device as claimed in claim 1 wherein the substrate is constructed of stainless steel, cobalt alloy, titanium cobalt-chromium or metallic alloy.
9. A device as claimed in claim 1 wherein the calcium phosphate coating is porous and the pores retain and elude a drug.
- 35 10. A device as claimed in claim 9 wherein the rate of release of the drug from the pores is controlled in an engineered manner.

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11. A device as claimed in claim 10 wherein the substrate has a first calcium phosphate coating and a second calcium phosphate coating and the drug is contained in the first and second coatings.
- 5 12. A device as claimed in claim 9 wherein the drug inhibits restenosis.
13. A device as claimed in claim 1 wherein the calcium phosphate coating is dicalcium phosphate, tricalcium phosphate or tetracalcium phosphate.
- 10 14. A device as claimed in claim 1 wherein the device is a human or animal tissue implantable device.
15. A device as claimed in claim 14 wherein the device is a stent.
- 15 16. A process of coating an implantable medical device with a calcium phosphate coating comprising:
 - (a) hydrolyzing a phosphor precursor in a water or alcohol based medium;
 - (b) adding a calcium salt precursor to the medium after the phosphite has been hydrolyzed to obtain a calcium phosphate gel;
 - 20 (c) depositing the calcium phosphate gel as a coating on the surface of a substrate; and
 - (d) calcining the calcium phosphate coating at a suitable elevated temperature and for pre-determined time to obtain a crystallized calcium phosphate having desired crystallinity, bonding and porosity characteristics.
- 25 17. A process as claimed in claim 16 wherein the deposition of the coating on the substrate is performed by aerosol deposition, dip-coating, spin-coating, electrophosphate coating or electrochemical coating.
- 30 18. A process as claimed in claim 16 wherein the calcium phosphate coating is calcined at a temperature of at least about 350°C.
19. A process as claimed in claim 16 wherein the calcium phosphate gel is hydroxyapatite gel.
- 35 20. A process as claimed in claim 16 wherein the thickness of the calcium phosphate coating on the substrate is between about 0.00001 mm and 0.01 mm.

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21. A process as claimed in claim 16 wherein the thickness of the calcium phosphate coating is between about 0.0001 mm to about 0.001 mm.
22. A process as claimed in claim 16 wherein the tensile bond strength between 5 the calcium phosphate coating and the substrate is greater than about 20 MPa.
23. A process as claimed in claim 16 wherein the calcium phosphate gel is deposited on the substrate as particles having a diameter between about 1 μ m and 100 μ m.
- 10 24. A process as claimed in claim 16 wherein the porosity of the calcium phosphate coating is controlled and retains and eludes a drug.
- 15 25. A process as claimed in claim 24 wherein the rate of release of drug is controlled in a defined manner.
26. A process as claimed in claim 16 wherein the calcium phosphate coating is hydroxyapatite, dicalcium phosphate, tricalcium phosphate or tetracalcium phosphate.
- 20 27. A process of coating a soft tissue implantable device with a calcium phosphate coating comprising:
 - (a) providing a soft tissue implantable substrate;
 - (b) depositing a calcium phosphate coating on the substrate utilizing a biomimetic deposition process; or
 - 25 (c) depositing the calcium coating on the substrate utilizing a calcium phosphate cement deposition process; or
 - (d) depositing the calcium phosphate coating on the substrate utilizing an electro-phoretic deposition process; or
 - (e) depositing a calcium phosphate coating on the substrate utilizing an 30 electrochemical deposition process.
28. A process as claimed in claim 27 wherein the substrate is a stent.
29. A process as claimed in claim 27 wherein the calcium phosphate coating is 35 hydroxyapatite.

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30. A process as claimed in claim 27 wherein the calcium phosphate coating is deposited discontinuously on the substrate as discrete particles.

31. A process as claimed in claim 27 wherein a first calcium phosphate coating is deposited on the substrate utilizing an aerosol-gel process, a sol-gel process, an electro-phoretic deposition process or an electrochemical deposition process and a second calcium phosphate coating is deposited on the first coating or the substrate utilizing an aerosol-gel process, a sol-gel process, a biomimetic process, a calcium phosphate cement process, an electro-phoretic deposition process or an electrochemical deposition process.

32. A process as claimed in claim 27 wherein the calcium phosphate coating contains a drug.

15 33. A process as claimed in claim 27 wherein the calcium phosphate coating is coated with a hydrogel film.

34. A process as claimed in claim 27 wherein the calcium phosphate is deposited on the substrate as discontinuous non-equiaxial particles.

20 35. A process as claimed in claim 34 wherein the non-equiaxial particles have an average size of about 0.1 μm and a thickness of up to about 0.01 mm.

25 36. A process as claimed in claim 31 wherein both the first and the second coatings contain a drug.